

How the Output Delivery System made UCAS data 'sing'

Universities and Colleges Admissions Service (UK)

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Introduction : UK Higher Education

Prospective students wishing to apply for entrance to universities and colleges in England, Wales, Scotland and Northern Ireland have been able to apply through a single central organisation to which they pay one fee for over three decades. Similarly, when students applied to study courses offered by polytechnics, they also applied through a single agency. Following the 1992 Education Act, the two bodies: the Universities Central Council on Admissions (UCCA) and the Polytechnics and Colleges Admissions Service (PCAS) were joined to form the Universities and Colleges Admissions Service: UCAS.

Throughout the time that these various organisations flourished they have held two functions. First, they supported prospective students who wished to apply to study full-time higher education courses and second, they provided those institutions - universities, polytechnics and colleges, with information that enabled them to plan the courses they offered and their proposed student intake. Until the 1986/7 Education Act, these two functions were achieved with relative ease. The Universities Grants Committee, and later the Universities Funding Council and the Polytechnics Funding Council, collaborated closely with the Department of Education and Science and the Treasury to ensure institutions received adequate funding to educate the required number of people. This was before higher education was transformed into a market.

Since 1993, with the establishment of UCAS, the separation of many of the statistical functions carried out by the Higher Education Statistics Agency, and the change in the role of the Funding Council from that of advocate of the universities

requirements to arm of the Government, planning has altered considerably. Universities and colleges have to bid for money; they are required to compete against each other for scarce resources, and lately to find for themselves niches for different types of students, for varying research activities and numerous enterprising roles. The activity of planning has become critical to survival.

Six years ago, UCAS offered its member institutions a set of 59 tables in its Annual Report, a weight of Management Statistics at two points if the year and several Applications Digests during the applications cycle. A helpful Enquiries Officer was on hand to interpret statistical tables and would even copy them for enquirers who did not have the facilities of a xerox machine. That is not what happen in the 21st century.

UK universities and colleges, although appreciative of helpful staff now require very different types of data customised to their needs. The niches they occupy in the educational market place mean that one set of statistics no longer meets the needs of all institutions. Each of them must have the facility to compare themselves with other institutions who are similar to them in different ways. They may be in the same town or city, occupy places in the same region or have similar profiles in the research assessment exercise.

Recently, the Funding Council has introduced Performance Indicators. In these, institutions are grouped with comparator institutions and ranked against each other to measure their performance. The Government has introduced a number of initiatives to widen access to higher education and institutions are now bidding to secure funds to help them in this task. The statistics that once met the needs of universities and colleges as they planned their student intakes have had to be completely reconstructed. Now institutions wish to compare and contrast their performance in a number of ways; to assess and meet the needs of their markets and to market themselves in an increasingly competitive national and international arena. They must bid for funds and look for collaborators to enable them to meet Government policies and gain the financial support they require to exist in a global market.

How the Output Delivery System Delivers

SAS[®] software has helped enormously in the management and provision of data to our customers who include marketing, planning and admissions staff at UK universities, research bodies, funding councils, government, commercial bodies and individual enquirers.

Their needs are wide and varied but are generally centred on the demand and supply of higher education courses in the context of (mostly) demographic profiles of applicants seeking acceptance to such courses.

Each year there are around 400,000 applicants making some 2 million applications to an increasing number (presently nearly 350) of universities and colleges in the UCAS scheme. Applicant data broadly consists of age, gender, ethnic origin, region of domicile, social class, subjects and universities and colleges applied to, subject and university or college of acceptance and entry qualifications. The combined data held for each year of entry amounts to some 350Mb – a collective total of 3Gb in 9th year.

With the advent of version 8 of SAS[®] we have made, and will continue to make, great use of the Output Delivery System[®]. Quite apart from the ease with which we are able to generate the tables, charts and other information required both by our customers and ourselves, the format makes it easily transportable to and useable by our customers. And this is simply because there is no guarantee that the customer will have either the software and/or the technical knowledge to handle more complex detailed but static output.

This paper addresses just one of those areas: the provision of 'management statistics'.

The management statistics are produced twice a year and comprise, for each institution, 48 unique cross-tabulations showing, for example, the number of applications, by course and age; course and gender; course and region of domicile...as illustrated in figure 1 :

Applications Aggregate Table T1A for University of Poppleton Course code by age and gender.										
Course code	12-17		18		19-20 (more age groups)		40 and over		Total	
	Men	Women	Men	Women	Men	...	Men	Women	Total	
007P	5	14	136	941	252	...	1	2	2317	
012E	0	0	48	26	36	...	0	1	157	
022E	0	0	3	19	2	...	0	0	35	
034W	0	0	29	53	36	...	0	1	167	
057P	0	0	2	10	6	...	0	0	28	
Q300	121	396	6125	15620	2502	...	51	227	32706	
[Total]	126	410	6343	16669	2834	...	52	231	35410	
[All UCAS]	25570	34743	471435	553014	227923	...	4204	7132	1749029	

Figure 1

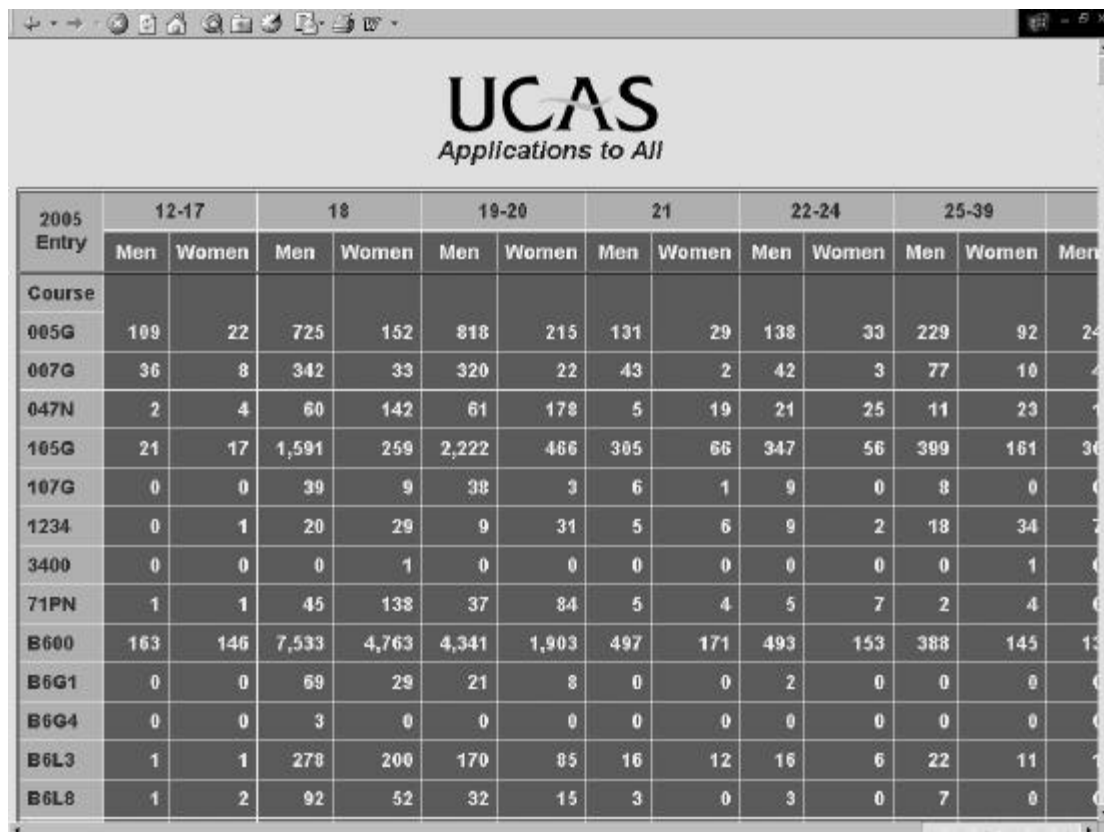
Up until recently, these tables were produced as CSV files together with a list of the files and their content so that the recipient could identify and open the required table into a spreadsheet.

Although HTML has been around for a number of years, it was not immediately apparent (some years ago!) as to how to automate the process of compiling nearly 17,000 unique tables in the required format without spending a possibly large amount of time developing a suitable application.

The Output Delivery System[®] not only solves this particular problem but, given an adequately thought-out design, makes the navigation of such information so much easier for the recipient. This inevitably leads to a significantly more useable and powerful end product.

Using the Tools|Options|Preferences|Results in SAS[®] version 8 it is possible to automatically generate HTML output without the need for any additional programming. Whilst occasionally extremely useful it is limited in its application.

With *minimal* programming the following can be produced automatically, to separate HTML files and, by the use of SAS[®] macros, 17,000 times.



UCAS
Applications to All

2005 Entry	12-17		18		19-20		21		22-24		25-39		Men
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	
Course													
005G	109	22	725	152	818	215	131	29	138	33	229	92	24
007G	36	8	342	33	320	22	43	2	42	3	77	10	4
047N	2	4	60	142	61	178	5	19	21	25	11	23	1
105G	21	17	1,591	259	2,222	466	305	66	347	56	399	161	36
107G	0	0	39	9	38	3	6	1	9	0	8	0	0
1234	0	1	20	29	9	31	5	6	9	2	18	34	7
3400	0	0	0	1	0	0	0	0	0	0	0	1	0
71PN	1	1	45	138	37	84	5	4	5	7	2	4	0
B600	163	146	7,533	4,763	4,341	1,903	497	171	493	153	388	145	13
B6G1	0	0	69	29	21	8	0	0	2	0	0	0	0
B6G4	0	0	3	0	0	0	0	0	0	0	0	0	0
B6L3	1	1	278	200	170	85	16	12	16	6	22	11	1
B6L8	1	2	92	52	32	15	3	0	3	0	7	0	0

Figure 2

Such HTML output can further be enhanced with the addition or alteration of formats, styles, colours, links and icons.

They can also easily be supplemented with index and contents frames giving the user easy access to whichever table is required. To access all three frames (index, contents and body) only one file need be selected. From there on access to all other data is selected using the options listed in the index and contents pages - in exactly the same way as a standard web site.

Figure 3 shows an example of the contents and body frames it is possible to produce with, again, minimal extra programming in the example application. It also illustrates the ease with which *all* available tables can be listed and thereby accessed, printed and, if required, copied to a spreadsheet.

The screenshot shows the UCAS Home Applications to All website. On the left is a navigation menu with links for various filters: Qualifications (Eng), Age by Gender (All), Social Class (All), UK Region (All), Scottish Region (All), Overseas Region (All), Ethnicity (All), Qualifications (All), Age by Gender (Eng), Social Class (Eng), UK Region (Eng), Scottish Region (Eng), Overseas Region (Eng), Ethnicity (Eng), and Qualifications (Eng). The main content area displays a table titled 'UCAS Home Applications to All' showing data for the year 2005. The table has columns for '2005 Entry', 'Social Class' (with sub-columns: 'x Not Known', '1 Professional', '2 Intermediate', '3 Skilled non-Manual', '4 Skilled Manual', '5 Partly Skilled', '6 Unskilled'), and 'Total'. The rows represent different courses: 005G, 007G, 047N, 105G, 107G, 1234, 3400, 71PN, B600, B6G1, B6G4, B6L3, B6L8, and B6N1.

2005 Entry	Social Class							Total
	x Not Known	1 Professional	2 Intermediate	3 Skilled non-Manual	4 Skilled Manual	5 Partly Skilled	6 Unskilled	
Course								
005G	515	136	669	358	638	251	106	2,572
007G	138	45	254	108	195	106	45	891
047N	84	31	169	61	102	55	13	515
105G	1,097	372	1,402	759	1,212	634	227	5,709
107G	25	10	25	13	29	5	5	112
1234	43	8	35	15	10	13	8	132
3400	0	0	1	0	0	0	0	1
71PN	29	19	111	38	99	19	0	315
B600	1,665	2,196	8,211	2,344	3,672	1,576	379	20,042
B6G1	7	13	50	12	22	8	2	114
B6G4	0	1	1	1	0	0	0	3
B6L3	83	77	340	81	145	60	16	802
B6L8	10	21	71	30	40	13	2	187
B6N1	59	94	276	57	115	41	8	650

Figure 3

The last stage (at least as far as this illustration is concerned) is to enhance the usefulness of the data on offer. This is done by the creation of graphs (again in HTML) such that the user can easily switch between a numerical and graphical representation of the data. The link from one to the other is achieved by adding a footnote that references the relevant graphics HTML file. It is this link (*from the graph to the table*), that potentially offers much more value to the end product.

The final figure shows the chart of overseas applicants applying to a university.

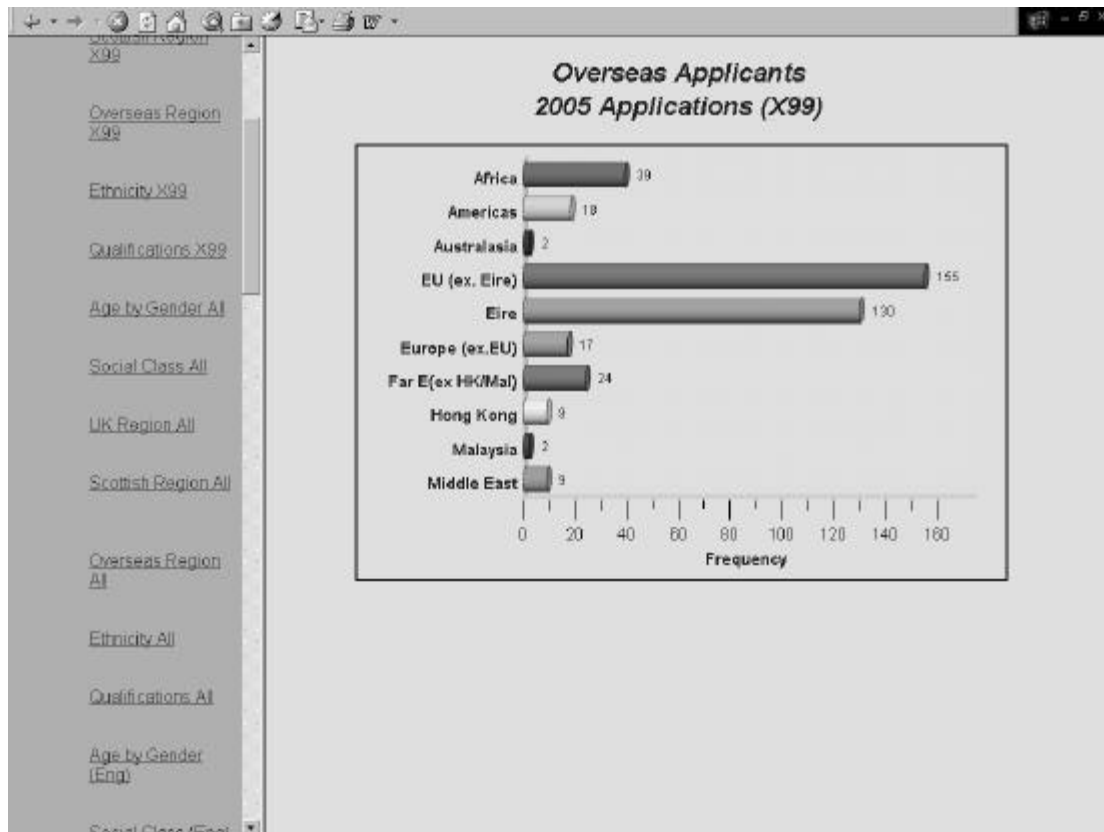


Figure 4

One of the key features of the chart not immediately apparent is that the bars themselves can be linked to *any* HTML file simply by clicking on them. Consequently, although *all* bars in this example are linked back to the same table, individual bars on the graph could just as easily be linked back to a table or another chart. In the example shown, it is perfectly possible (and easy) to write code that provides a much more detailed analysis of applicants from Hong Kong.

All of the above provides ample room for manoeuvre, not just from the aspect of data delivery but also for creativity in the design of the end product. In addition, the resultant files can be delivered to the customer who can decide for themselves whether to install them on their own PC, all the department's PCs or on their intranet. Alternatively, they could be made freely available on the web site of the company producing them.

Finally, (as if that weren't enough of an improvement in information delivery for our customers!), there's the added feature of being able, on receipt of the files, to interactively change the colour, type, font, aspect, rotation, size, statistics, labels, outlines, axes...of the charts. And then print or save those changes for future use.

As with ODS[®], Proc Tabulate, Proc Template, Proc Print, Proc Gchart and SAS[®] Macros (all of the procedures used to create the example application) much of the credit for such interactive features naturally goes to SAS[®]. Our involvement ? Simply changing DEVICE=GIF to DEVICE=ACTIVEX.

That's it.

Much of the information supplied here is available from a variety of sources. The three main ones used in our case were SAS[®] version 8 OnlineDoc, the SAS[®] web site and SAS[®] course notes entitled 'Getting Started with the Output Delivery System'. The last of these is the most notable since it is particularly striking that so much has been possible – and without a great deal of effort and time – from a course which appears to be simply an introduction to ODS[®]!

So, where to next ?

There are many SAS[®] developments which are of great interest : SAS[®]/Intrnet, Portals, WAP applications, dynamic web-based applications and ad-hoc reporting, multi-processor connection, using ODS[®] to send data to RTF files for automatic report generation, interactive maps...in fact much of the content of SeUGI19 and SUGI26.

However, much as we have no doubt that there are many more improvements to the way we handle and disseminate information, the key point must always be that the attraction of *any* future developments are second only to what exactly we are trying to achieve by them.

The application described in this paper is an excellent example of using developments and technology that is appropriate to the task in hand.

Sample code illustrating the features described is available from R.Coleman@ucas.ac.uk Tel (International +44) (0)1242 544886

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